Spatial association patterns of foundation shrubs in the East Mojave

Abstract

Major results: Spatial patterning consistent with facilitation of cholla cactus by shrubs, does not appear to be species specific.

Consistent with competition between ambrosia salsola and larrea tridentata. Competition between larrea tridentata and ambrosia dumosa vis allelopathic root exudates has been shown experimentally. A. salsola and A. dumosa are able to hybridize.

Intro

Foundation plants and shrubs.

Spatial association patterns.

Spatial statistics. What do patterns tell you?

The underlying hypothesis is that plants in facilitative interaction do better together than when apart, leading to a clustered distribution. Plants undergoing competitive interaction do better apart leading to a more dispersed distribution.

Revisiting cactus and shrub. Facilitation and competition.

Study site

Sunset Cove, Granite Mountains. Dates.

Methods.

All woody shrubs and cactus were mapped in three 80 m by 20 m rectangular transects to the nearest 5 cm. Individuals were mapped to the center of the plant, as it was not possible to ascertain where each shrub roots. The widest axis, its perpendicular meaurement, and height of each individual were recorded. A few species of shrub had not completed leafed out, and so the woody parts of the shrub without leave were measured as a proxy for its approximate size. The goal is to determine association patterns based on shrub size, and only using the small, new growth would underestimate the size. In the cases where multiple stems came out of the ground and growth only on one, only the stems with growth were measured, otherwise can’t be certain same plant.

Ephedra grows clonally (cite), the centre of the clonal growth was mapped. Larrea also grows clonally, the centre was measured, entire clump measured and the number of stems estimated. All shrubs were identified or assigned a morphospecies number.

Analysis

Mapping.

Point pattern analysis using spatstat in R.

Calculate g-statistic…

Join count using spdep in R.

Join counts are generally an areal method. However, they can be applied to polygons of irregular shape by using the centroid, and computing a distance matrix. Shrubs are not necessarily well estimated by points, and are really polygons. Join counts estimate the expected identity of neighbours given everyone’s total abundances within a population. There are issues with multiple testing so only super significant results that occurred in each transect tested independently were reported.